

~~3~~ 1000

File

A Summary Review of "Sleep Learning"
With Special Reference to the
Acquisition of Foreign Language Skills

July 1965

(238)

BRIEF

Problem

To appraise "sleep learning" as a technique for acquiring verbal skills with special reference to foreign language learning.

Procedure

A survey was made of a variety of sources dealing with learning during sleep. The review included the technical literature, popular books, commercial pamphlets, Eastern European materials, and communications from scientists familiar with the problem. The material was analyzed in terms of the evidence presented for or against sleep learning as a practical training technique.

Conclusions

1. Regardless of present day accounts of spectacular foreign language capabilities acquired during sleep^{1/}, no acceptable evidence that sleep learning is an effective technique in foreign language training has been uncovered in our survey. Verbal learning, as commonly understood, does not occur during actual sleep. Although some verbal learning can occur during low levels of wakefulness, such as drowsiness or reverie, there is no acquisition of such knowledge during real sleep.

^{1/} Appendix 1 gives a sample of such accounts. The items mentioned in this sample were the impetus for this paper and received special attention in our review.

2. The possibility of any practical results of further research in the area of verbal learning during sleep and especially foreign language learning would seem to be rather unlikely. Unless some new and promising materials or procedures in this area are evolved, we would suggest that further research, if any is contemplated, be directed toward other, less dramatic, but more feasible objectives.

3. The procedure of listening to and practicing with foreign language material during periods of leisure, relaxation, or simple physical routine can result in increased knowledge and skill. The possible increase in foreign language competence expected from such practices should, of course, be assessed in terms of the psychological and physiological costs.

A SUMMARY REVIEW OF "Sleep Learning"
With Special Reference to the
Acquisition of Foreign Language Skills

Problem

The claim that knowledge can be acquired without effort is the promise of sleep learning. The purpose of the present paper is to assess this claim with particular reference to the learning of foreign languages.

Definition of "Sleep Learning"

The term "Sleep Learning," as used in the present paper, refers to the learning, or supposed learning, of some verbal subject matter or skill during a state of natural sleep. That this is the common meaning of the term is apparent from a review of popular and commercial sources, as well as from the scientific literature, both of which are listed in the table of references on page 11.

The references mentioned indicate a general and common meaning to the term "Sleep Learning." Other similar terms are "sleep education" and "sleep teaching." The sleep learning idea is sometimes associated with hypnotism, as in "hypnopedia." Sometimes sleep learning is associated with therapy, as in "sleep therapy." These meanings and usages apparently occur on a wide basis, being found in both European and Western literatures.

The fact of widespread agreement as to the meaning of the term, however, is no necessary reason for believing that sleep learning actually occurs. In order to test whether sleep learning does take

place, some objective criterion of deciding whether a person is or is not asleep, as well as whether the person has or has not learned anything while in the sleeping state must be utilized.

Although there are technical reasons for regarding both sleep and learning as continuous phenomena such that one speaks of levels in the sleep-wakefulness continuum or of levels in the simple-to-complex learning continuum, it is also true that reliable judgments can be made as to whether a person is or is not asleep and, independently, as to whether a person has or has not learned something.

Criterion of Sleep

Electroencephalographic (EEG) or brain wave monitoring of a person, in a sleeping condition, enables observers to agree as to whether he is or is not asleep at any one moment: the absence of alpha wave is commonly taken to indicate loss of consciousness or onset of actual sleep; presence of delta wave indicates deep sleep. Though other indicators of sleep are also used, the alpha and delta wave criteria are in good standing. (16, 19, 20)

Criterion of Learning

Learning, or the acquisition of knowledge, is commonly demonstrated by a variety of questioning or testing procedures. If a person did not know the answer to a question yesterday and knows it today, this is generally taken as indicating he learned the answer in the meantime. Learning is generally inferred on the basis of an increase in knowledge or an improvement in performance attributed to experience, instruction, study, or practice.

Purpose of Paper

This paper is concerned with the practical problem of assessing the contribution of sleep learning to the language teaching process. The major contribution to this assessment problem comes from a series of studies by Charles W. Simon and William H. Emmons. These authors systematically reviewed the sleep learning literature for the RAND Corporation some years ago. Their laboratory controlled, yet highly practical, experiments on sleep learning are widely accepted as the most authoritative and definitive work that has been done on the problem of verbal or "complex" learning during sleep. The major failing of studies which purport to demonstrate "sleep learning" is the use of an inadequate or casual method of determining when the learner was asleep.

In view of this common fault, the technically sophisticated work of Simon and Emmons warrants the following detailed explication.

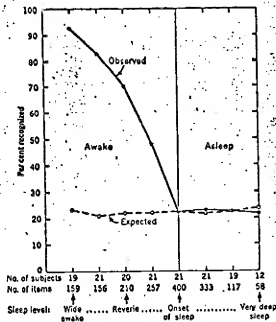
The Simon and Emmons Experiments

In order to determine whether knowledge could be acquired during sleep, Simon and Emmons (13) played general information question-and-answer items one by one at five-minute intervals throughout the night to 21 people. There were 96 questions in all, and each question was played to each person in the experimental group one time. By also measuring the depth of sleep of each subject continuously during the night by means of the EEG, it was possible to determine whether a person had learned the answer to a particular item while he was

asleep or while he was awake. A baseline against which to compare the amount learned by the experimental "sleep learning" group was provided by a matched control group of 64 people who received no intervening training on the items. It was found that the greatest learning occurred when the subject was wide awake, that less and less material was learned as the people became drowsier and drowsier, and that when the people became really asleep, all learning stopped, the level of knowledge then being no higher than the knowledge baseline of the control people who had received no training. As shown in the graph on page 7, the disappearance of all learning with the onset of actual sleep is clear-cut. The authors concluded that "the results support the hypothesis that learning during sleep is unlikely."

In the study just described, each person in the sleep-trained group was exposed to each question-and-answer combination once and only once. A second experiment (6) was performed to determine whether sleep learning would occur if the people had common one-syllable words played to them over and over again many times during actual sleep. By giving the people many exposures to the items, a greater opportunity was provided for sleep learning to manifest itself. The number of times the items were presented during actual sleep varied from 16 times for some people to as many as 82 times for others, the average for the group being 46 presentations. Again, no learning occurred during periods when the EEG indicated that the people were truly asleep.

Percentage of answers recognized on multiple-choice test*



* Items were presented at varying levels along the continuum between a waking and deep sleep state. The expected value was that obtained from an untrained control of comparable ability answering the same items.

(Simon and Emmons, 1956, p. 94)

as quoted by Berelson, B. and Steiner, G.A.

Human Behavior: An Inventory of Scientific Findings,
New York, Harcourt, Brace & World, 1964, p. 179.

Probably no study of a complicated problem can arrive at conclusive proofs. In this vein, Simon and Emmons (18) state, "Perhaps the future development of new and unknown techniques will permit someone to learn complex material while he sleeps, but for the present, sleep-learning is not the simple matter that some experimenters and commercial firms, which sell equipment for this purpose, would lead us to believe."

Other Considerations

There is evidence that simple conditioned reflexes can be instituted during sleep in animals and, presumably, in man. (1, 7, 9) Thus, sleep learning can legitimately be defended in a technical or laboratory sense, though not in a practical or real-life sense. It would be misleading to interpret such data out of context in an attempt to provide scientific status to the popular sleep learning movement.

If learning during real sleep is impossible, and if one's entire wide-awake schedule is filled with active work or study, what about the periods in between? Could the reverie or drowsy states be used to acquire additional knowledge?

Learning during the drowsy state is certainly possible. Simon and Emmons point out that "approximately 30% of the --- material presented in the period just prior to sleep was recalled." (18) The question is whether it is wise to use the drowsy phase for purposes of acquiring knowledge. For normal people under standard

conditions, as is typically the situation in learning a foreign language, the attempt to acquire knowledge during the drowsy state would seem inefficient and unnecessary.

Some people so skillfully manage their lives and schedule their time that they work more hours per day than the average person, yet also obtain adequate amounts of relaxation and sleep. Other things being equal, a person who works more hours per day will accomplish more in his total career than will someone who works less. The number of hours per day which students work while acquiring a foreign language ranges from very few to very many, depending upon a host of personal and situational variables.

At the present time, some schools encourage students to listen to foreign language material via tape recorder whenever they are able. Some students listen to foreign language recordings while shaving, or while driving to work, or while getting ready to retire for the night. Beyond some point, however, even the most steadfastly motivated students will succumb to too much work and too much listening: they may take very obvious and direct steps to avoid the sound, such as turning the machine off, or they may simply fall asleep and ignore it. Such incidental learning has much to commend it and is frequently utilized without ill effects by students and educators.

However, none of the considerations listed above are of such importance as to impair the validity of the major conclusion reached by this review: verbal learning, as commonly understood, does not occur during actual sleep.

APPENDIX 1

Accounts of Foreign Language Capabilities Acquired During Sleep

Russ Pick Up English Lying Down---Asleep

SP. Chronicle
Moscow April 65

In Russian experiments in "sleep-learning" one woman student mastered a course of ~~SIX~~ ENGLISH in 25 nights.

When she was tested at Kiev State University it was found that her knowledge was equivalent to that achieved in the normal first-year course at the university.

This is reported in an article by a Russian journalist, Vilen Lustberg, which appears in the March issue of the magazine New Education.

DISTORTED

Lustberg describes experiments in group instruction at the Kiev Higher Radio-Engineering School. After the pupils fall asleep, words and phrases are read to them in a voice which is distorted to emphasize those characteris-

tics of speech which are best perceived during sleep.

At present about 30 words are ~~learned~~ each night and it is hoped to reach 50-60 words.

LEONID Buzachetchenka, a physicist at the Ukrainian Academy of Sciences, says it is possible to memorize up to 400 words and phrases in a night.

Dr. Abram Svyadosch, who began experiments in the 1950s, says that sleep-learning tires the brain less than normal learning.

Although the brain functions as a unit, not all its areas are in the same state at any given moment.

Lustberg says: "The wakeful cerebral cortex resembles a mosaic with interchanging points of excitation and inhibition; that is, it is continually in a state of partial sleep, simultaneously vigilant and relaxing."

SLEEP

In the same way, during sleep the capacity for work of many cells of the cerebral cortex remains. The receptive faculty of the mind can still function through these cells, although the system controlling the conscious mind is inhibited and at rest.

In early experiments, D. Svyadosch successfully

taught people, aged from 10 to 60 years, during sleep. Six per cent. The age of the person absorbed 89.3 per cent did not seem to matter. of the material, but the other

Manchester Guardian

SELECTED REFERENCES *

1. Beh, H.C. "Discrimination and Conditioning During Sleep as Indicated by the Electroencephalogram," Science, Vol. 147, 19 March 1965, 1470-1471.
2. Brozek, Josef. "Recent Developments in Soviet Psychology," Annual Review of Psychology, Vol. 15, 1964, 493-594.
3. Consumer Bulletin. "Education While You Sleep?" October 1960:
4. Curtis, David. Learn While You Sleep. New York: Libra, 1960.
5. Curtis, David. Sleep and Learn. New York: Robert Leni Corp., 1963.
6. Emmons, W.H. & Simon, C.W. "The Non-Recall of Material Presented During Sleep," The American Journal of Psychology, Vol. 69, (1), 1956, 76-81.
7. Granda, A.M. "Operant Behavior During Sleep," Science, Vol. 133, 12 May 1961, 1485-1486.
8. Journal of the American Medical Association, "Learning During Sleep," Vol. 166, (8), 22 February 1958, 937-938.
9. Kleitman, Nathaniel. Sleep and Wakefulness. Illinois: University of Chicago Press, 1963, revised edition.
10. Konstantinovskiy, M. "Bell for Class--Sleep Peacefully," (translated and republished as "Soviet Research on Teaching During Sleep," "Kiev Higher Radiotechnical Engineering School Teaches English During Sleep" and "Development of a Method of Teaching During Sleep,") JPRS: 25,895 Joint Publications Research Service, U.S. Department of Commerce, 13 August 1964.

11. Kulikov, V.M. "On the Problem of Learning During Sleep,"
Voprosy Psikhologii, (2), 1964, 87-97.
12. Lindsley, Ogden R. "Operant Behavior During Sleep: A Measure
of Depth of Sleep," Science, Vol. 126, (3286), 1957,
1290-1291.
13. Pollack, Cecelia. "Sleep-Learning as an Aid in Teaching Reading
to a Brain-Injured Boy," J. Ment. Defic. Res., Vol. 6, (2),
1962, 101-107.
14. Razran, G.H.S. "The Observable Unconscious and the Inferable
Conscious in Current Soviet Psychophysiology: Interoceptive
Conditioning, Semantic Conditioning, and the Orienting
Reflex," Psychological Review, Vol. 68, (2), 1961, 81-147.
15. Razran, G.H.S. "Russian Physiologists' Psychology and American
Experimental Psychology: An Historical and a Systematic
Collation and a Look into the Future," Psychological Bulletin,
Vol. 63, (1), 42-64, 1965.
16. Simon, C.W. & Emmons, W.H. Considerations for Research in a Sleep
Learning Program, Santa Monica, RAND Corp., 1954.
17. Simon, C.W. & Emmons, W.H. "Learning During Sleep?" Psychological
Bulletin, Vol. 52, 1955, 328-342.
18. Simon, C.W. & Emmons, W.H. "Responses to Material Presented
During Various Levels of Sleep," Journal of Experimental
Psychology, Vol. 51, (2), 1956, 39-97.

19. Simon, C.W. & Emmons, W.H. "ASG, Consciousness and Sleep," Science, Vol. 124, (3231), 30 November 1956, 1066-1069.
20. Simon, C.W. "Some Immediate Effects of Drowsiness and Sleep on Normal Human Performance," Human Factors, Vol. 3, (1), 1961, 1-17.
21. Svyadosch, A.M. "Perception and Memory of Speech During Natural Sleep," Voprosy Psikhologii, (1), 1962, 65-80.
22. Zavalova, N.D., «Zukhar', V.F. & Petrov, Yu.A. "On the Problem of Learning During Sleep," Voprosy Psikhologii, (2), 1964, 98-102.

* In addition to the selected references listed above, various other materials pertaining to sleep learning were assessed and correspondence with government and business bureaus, as well as with individual researchers in both the United States and Eastern Europe was initiated to insure comprehensive and up to date coverage of the sleep learning problem.